Spectral interference

Introduction

Spectral interference on an analyte peak can also result from the solvent itself, particularly non-aqueous solvents. Emissions from carbon when analyzing samples diluted in organic solvents are widely known to interfere with important elements. For example, in the analysis of wear metals in oils, complex background structures compromise detection limits for lithium and potassium. Traditionally, the carbon deposition can be avoided by adding a small amount of oxygen to the intermediate gas flow. However, the use of oxygen to support complete combustion of carbon further increases the complexity of the experimental setup and the cost per analysis. In previous studies, it was demonstrated that the spectral interferences caused by organic matrices can be eliminated by **MultiNeb®** nebulizer. This nebulizer allows the simultaneous introduction of organic and aqueous solutions into the plasma. The additional water eliminates spectral interferences created by carbon compounds and avoids injector clogging and, therefore, prevents the resulting loss of sensitivity and precision. This implies an important advantage over conventional systems since it does not require the continuous cleaning of ICP components or the use of expensive additional components such as cooled spray chambers or an auxiliary oxygen supply.

2 Experimental

2.1 Solvents

The organic solvent used in this study was kerosene (QP, Panreac, Barcelona, Spain. Boiling range: 190–250 °C) and the aqueous solvent used was distilled deionized water (18 MΩ cm resistivity).

2.2 Instrumentation

All measurements are made using an axial view inductively coupled plasma optical emission spectrometer **Agilent 720** ES (Agilent). The operating conditions are shown in Table 1.

Parameters	
Plasma power (kW)	1.2
Plasma gas flow rate (L min^{-1})	15
Auxiliary gas flow rate (L min^{-1})	1.5
Total nebulizer gas flow rate (L min^{-1})	0.75
Organic flow rate (µL min^{-1})	50
Aqueous flow rate (µL min^{-1})	100
Replicates	3
Read time (s)	1.0
Nebulizer	MultiNeb®
Spray chamber	Cyclonic

P.I. Parque Plata C/ Camino Mozárabe, 41
41900 Camas, Seville (Spain)
T. (+34) 954081214
E. info@ingeniatrics.com
www.ingeniatrics.com

3 Results and discussion

3.1. Background emission

Figure 1 shows the spectrum in the vicinity of the Li I emission line at 670.783 nm and the K I 766.491 nm when water was introduced using the **MultiNeb®**. As it can be seen, no spectral interference is observed in both spectra.

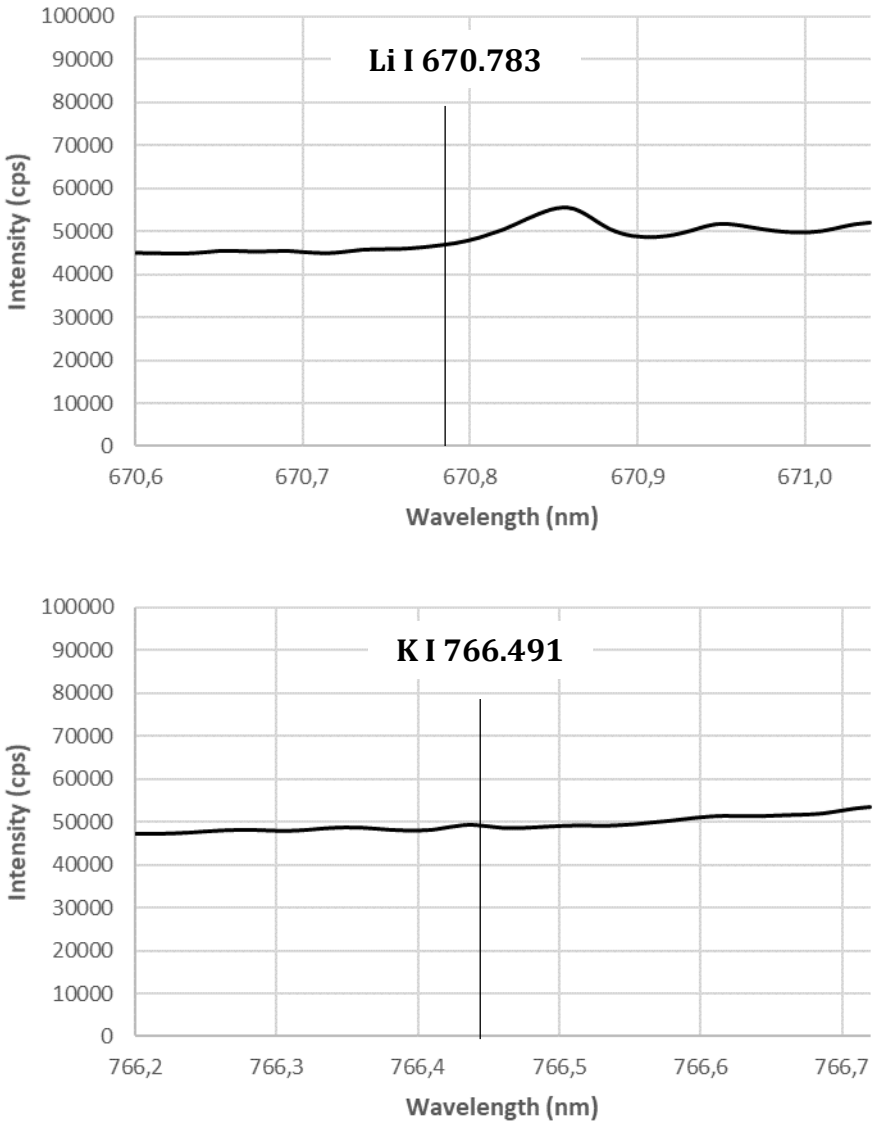

Figure 1. Spectra of lithium and potassium emission lines in water solution.

However, when the kerosene is introduced through the **MultiNeb®**, an intense peak at 670.783 nm can be observed, compromising the accuracy of Li determination in the analysis (Figure 2A, dot line). In case of potassium, several carbon emissions can be observed in the vicinity of the potassium emission line (Figure 2B, dot line).

In order to eliminate the spectral interferences, the simultaneous introduction of organic and aqueous solutions have been employed and the results are shown in Figure 2A (black line) for lithium and Figure 2B (black line) for potassium. As can be seen, the addition of water eliminates the carbon spectral interference since the

water contains enough oxygen to support complete combustion of carbon in the plasma.

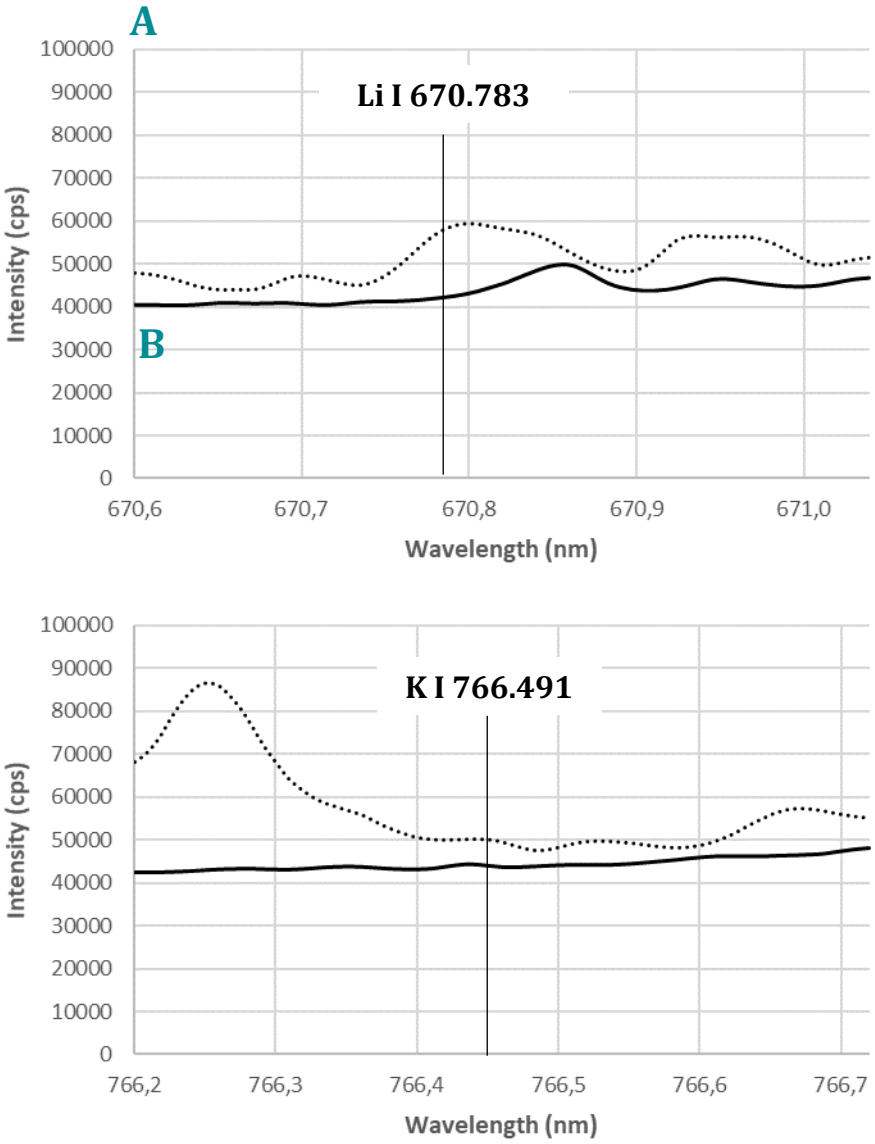

Figure 2. A: Comparison between the lithium spectrum obtained introducing organic solution (dot line) and the spectrum obtaining introducing simultaneously organic and aqueous solutions (black line). B: Comparison between the potassium spectrum obtained introducing organic solution (dot line) and the spectrum obtaining introducing simultaneously organic and aqueous solutions (black line).

4 Conclusions

This work has demonstrated that the use of the new **MultiNeb®** can eliminate the carbon spectral interference by simultaneous introduction of organic and aqueous solutions. This simple and powerful alternative to remove spectral interference caused by organic matrix enable to analyze organic samples with confidence.

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